

THE AQUATIC HYPHOMYCETES OF THE APIES RIVER, SOUTH AFRICA

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ABSTRACT

To increase our knowledge of South African freshwater Hyphomycetes, a study was done on the Hyphomycetes of the Apies river. This has led to the identification of 18 species representing 10 genera, of which 4 are new records for South Africa and 3 new records for the African continent.

UITTREKSEL

DIE AKWATIESE HIFOMISETE VAN DIE APIESRIVIER, SUID-AFRIKA

Ten einde die kennis van Suid-Afrikaanse varswater hifomisete uit te brei, is 'n ondersoek na die hifomisete van die Apiesrivier gedoen. Hierdie studie het gelei tot die identifisering van 18 spesies wat 10 genusse verteenwoordig, waarvan 4 nuwe rekords vir Suid-Afrika en 3 nuwe rekords vir die Afrika kontinent is.

INTRODUCTION

The hyphomycete flora of fast-flowing rivers has been the subject of extensive taxonomic studies since 1942, when Ingold began a series of publications revealing the diversity of aquatic hyphomycete species. Relatively few reports have come from Southern Africa (Ingold, 1958; 1973) and only one study from South Africa is known (Greathead, 1961) in which 18 records were documented for the Eastern Cape Province.

This study was therefore undertaken to expand on the knowledge of the range of species found in South Africa, and to contribute new records for a more complete distribution pattern of the aquatic Hyphomycetes.

MATERIAL AND METHODS

All samples were collected from the Apies river near Pretoria. The stream flows through rich vegetation and the banks are bordered by deciduous trees, predominantly *Celtis africana* Burm. f., *Combretum erythrophyllum* (Burch.) Sond., *Kiggelaria africana* L., *Populus* spp., and *Salix babylonica* L.f. Grasses such as *Hyparrhenia hirta* (L.) Stapf, *Poa annua* L. and *Setaria chevalieri* Stapf ex Stapf and C. E. Hubb. are also present. Aquatic plants are represented by *Ethulia conyzoides* L. only, which grows predominantly in the shallow waters. The river-bed is principally of gravel.

Submerged leaves, both well-decayed and freshly fallen, were collected at

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regular intervals from March through August. The leaves were immediately taken to the laboratory where they were rinsed with sterile distilled water, placed in sterile Petri dishes with sterile distilled water and incubated at 15 °C (Webster, 1975).

After 24–48 hours the leaves were examined microscopically for hyphomycete growth, and the Petri dish bottom was scanned for settled spores. Foam and scum samples were collected in sterile screw cap bottles, and microscope slides were then prepared in the laboratory using lactophenol cotton blue as a mounting medium. Water samples were also collected and filtered using 13 mm diameter Millipore filters with 8 µm pore size (Iqbal and Webster, 1977). The precipitate on the filters were scraped onto microscope slides and mounted in lactophenol cotton blue.

Cultures were made from incubated leaves and foam samples using flame drawn Pasteurpipettes to transfer single spores on to 2 % Difco malt extract agar with 62,5 mg sodium novobiocin (albamycin-T) per 1 000 cm³ distilled water to inhibit bacterial growth.

Spore development was studied by placing agarstrips of hyphomycete culture in a petri dish containing sterile distilled water. The suspension was aerated by forcing compressed air through a pipette containing sterile cotton wool and allowing the air to bubble through the suspension in the Petri dish. All cultures were kept at 15 °C.

RESULTS

The investigation has resulted in the identification of 18 species representing 10 genera (Table 1). These species are illustrated in Figures 1 and 2. *Alatospora constricta* Dyko, *Camphylospora chaetocladia* Ranzoni, *Lemonniera pseudofloscula* Dyko and *Triscelophorus acuminatus* Nawawi are new records for South Africa and, except for *Camphylospora chaetocladia*, new records for the African continent.

The aquatic Hyphomycetes occurring most frequently are *Tetracladium marchalianum* de Wild., *Tetracladium* sp. and *Triscelophorus acuminatus*. *Lemonniera pseudofloscula* and *Scorpiosporium* sp. were observed only once in one foam sample. *Lunulospora curvula* Ingold and *Tricladium* spp. showed a marked variation in seasonal abundance. *Flagellospora penicillioides* Ingold, *Lunulospora curvula*, *Tetracladium marchalianum* and *Tetracladium* sp. were successfully isolated and cultured.

During March, heavy rainfall occurred and the river flooded occasionally. The number of spores found during that period was low. In early winter, especially during June, there was no rain and in many of the river's tributaries the flow-rate was very low. At times the water became stagnant and rich in algae and bacteria.

The flow of the main river, however, remained continuous. When the water

TABLE 1.

Precipitation, water temperature and seasonal distribution of aquatic Hyphomycetes of the Apies river.

(Occurrence is recorded as follows: ***abundant; **common; *rare)

	March	April	May	June	July	August
<i>Alatospora acuminata</i>	**	**	**	***	***	***
<i>Alatospora constricta</i>		*				
<i>Anguillospora longissima</i>	***	***	***	**	**	**
<i>Articulospora tetracladia</i>			**	***	***	***
<i>Campylospora chaetocladia</i>		*	**	**	***	***
<i>Flagellospora curvula</i> Ingold		**	**	**	*	*
<i>Flagellospora penicillioides</i>	***	***	***	**	**	**
<i>Lemonniera pseudofloscula</i>			*			
<i>Lunulospora curvula</i>	***	***	***	**	**	**
<i>Scorpiosporium</i> sp.		*				
<i>Tetracladium marchalianum</i>	***	***	***	***	***	***
<i>Tetracladium setigerum</i>	*	*	*	*	*	*
<i>Tetracladium</i> cf. <i>setigerum</i>	***	***	***	***	***	***
<i>Tricladium gracile</i>			**	**	**	**
<i>Tricladium splendens</i>			**	**	**	**
<i>Tricladium</i> spp.				***	***	***
<i>Triscelophorus acuminatus</i>		**	***	***	***	***
<i>Triscelophorus monosporus</i>		**	**	**	**	**
Species total	7	13	14	15	15	15
Water temperature (°C)	15,9	10,3	8,6	6,3	5,88	5,44
Precipitation (mm)	59,7	18,1	12,1	0	12,2	16,7

*** abundant: large numbers of the same spore-species found in each sample

** common: the same species found in each sample, but not in large numbers

*rare: single spores found only occasionally in samples

level was high, species such as *Anguillospora longissima* (Sacc & Syd) Ingold, *Flagellospora penicillioides*, *Lunulospora curvula*, *Tetracladium marchalianum* and *Tetracladium* cf. *setigerum* occurred in great abundance. *Articulospora tetracladia* Ingold, *Alatospora acuminata* Ingold, *Tricladium* spp. and *Triscelophorus acuminatus* were found in large numbers when the water temperature was lowest and the water flow was at a minimum. *Campylospora anachaetocladia* occurred from June to August, but *Lunulospora curvula* and *Flagellospora* spp. were found only occasionally during this period.

DISCUSSION

During autumn and winter (April to August) the abundance of the fungi and the diversity of its species composition increased. This is in agreement with Conway's findings (Conway, 1970). The Apies river is well shaded at the localities that were sampled and this may well contribute to the low water temperature which is certainly a factor in the abundance of the aquatic Hyphomycetes found.

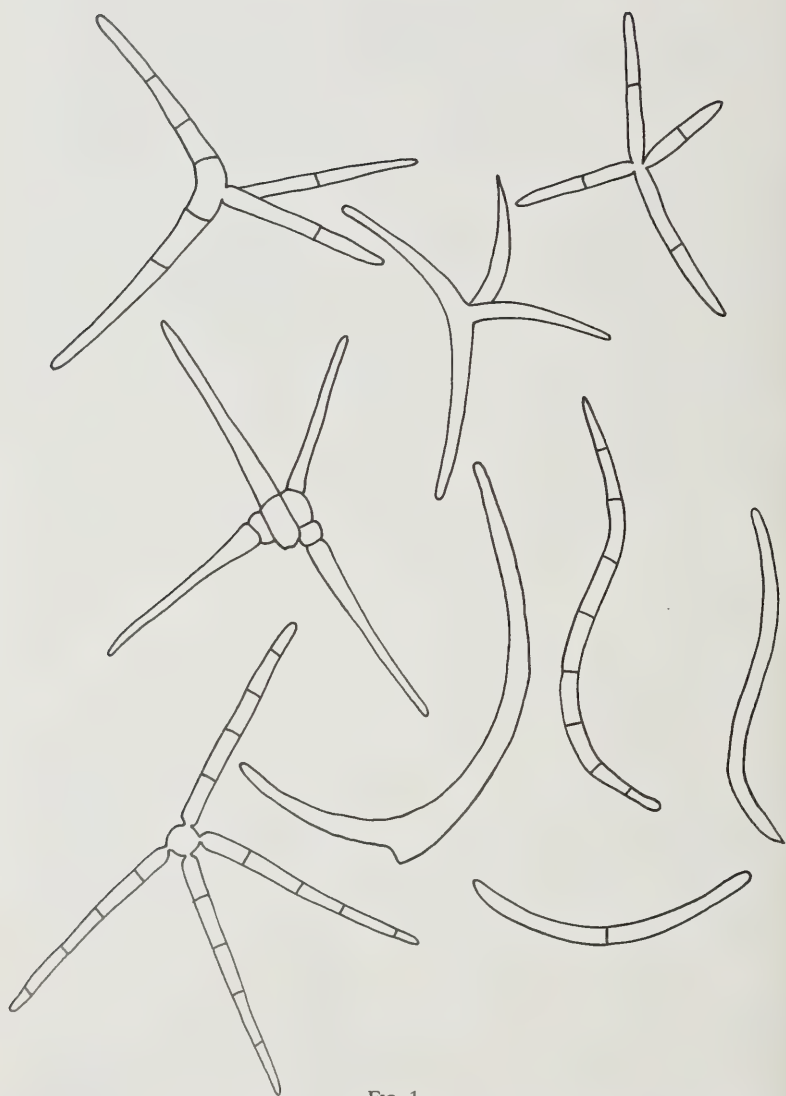


FIG. 1.

Conidiospores of aquatic Hyphomycetes of the Apies river collected from precipitates from filters. 1. *Alatospora acuminata*; 2. *A. constricta*; 3. *Anguillospora longissima*; 4. *Articulospora tetracladia*; 5. *Campylospora chaetocladia*; 6. *Flagellospora curvula*; 7. *F. penicillioides*; 8. *Lemonnieria pseudofloscula*; 9. *Lunulospora curvula*.

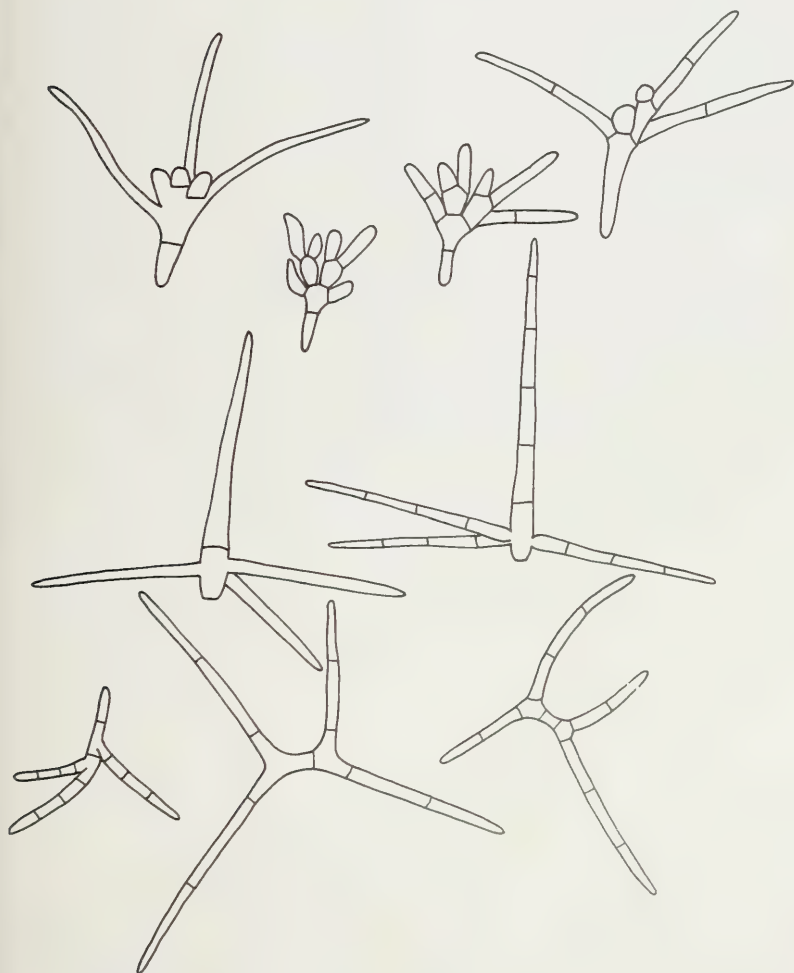


FIG. 2.

Condiospores of aquatic Hyphomycetes of the Apies river collected from precipitates from filters. 1. *Tetracladium marchalianum*; 2. *T. setigerum*; 3. *Tetracladium* cf. *setigerum*; 4. *Tricladium gracile*; 5. *Tricladium splendens*; 6. *Tricladium* sp.; 7. *Triselophorus acuminatus*; 8. *Triselophorus monosporus*.

Spores similar in morphology to *Tetracladium setigerum* were found in abundance throughout the period of study (Fig. 2). Cultural studies are still in progress to determine whether it is not in fact a new species of *Tetracladium*. Spores of the typical *T. setigerum* were also found, but only very rarely (Table 1).

Most of the fungi found in the Apies river could be placed into the groupings suggested by Nilsson (1964):

TABLE 2.

The geographical distribution of aquatic Hyphomycetes of the Apies river according to the grouping suggested by Nilsson.

Group A

Worldwide distribution

A.1 Mostly tropical

Campylospora chaetoclada Ranzoni

Flagellospora penicillioides Ingold

Triscelophorus monosporus Ingold

A.2 Mostly temperate or cold

Alatospora acuminata Ingold

Anguillospora longissima (Sacc & Syd) Ingold

Articulospora tetracladia Ingold

Lunulospora curvula Ingold

Tetracladium marchalianum de Wild.

Tricladium gracile Ingold

Tricladium splendens Ingold

Group B

Temperate or cold only

No spores of this group found.

Group C

Uncommon or limited distribution

C.1 Tropical only

No spores found

C.2 Temperate or cold only

Alatospora constricta Dyko

Lemonnieria pseudofloscula Dyko

Triscelophorus acuminatus Nawawi

It is clear that the fungi with a world-wide distribution is apparently the dominant fungi in the Apies river (Table 2), especially the fungi which are typical for the colder zones of the world. *Campylospora chaetoclada*, *Flagellospora penicillioides* and *Triscelophorus monosporus* are fungi typical of the tropical zones of the world, while *Triscelophorus acuminatus* and *Lemonnieria pseudofloscula* with a limited distribution, also occurred in the Apies river. From the results it appears that the hyphomycete composition of the Apies river occupies a transitional position between that of the colder areas and the more tropical

zones, but it must be kept in mind that the validity of Nilsson's groupings are tentative (Ranzoni, 1979).

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